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SEMIANNUAL PROGRESS REPORT

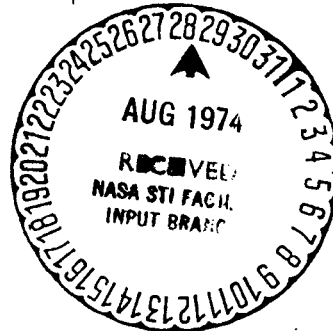
NASA GRANT NgR 05-007-077

"INVESTIGATION OF TECHNIQUES FOR ANALYSIS OF ANCIENT
SEDIMENTS AND EXTRATERRESTRIAL MATERIALS"

June 1, 1967 - November 30, 1967

Principal Investigator: I. R. Kaplan

February 1968



(NASA-CR-138197) INVESTIGATION OF
TECHNIQUES FOR ANALYSIS OF ANCIENT
SEDIMENTS AND EXTRATERRESTRIAL MATERIALS
Semiannual Progress Report, 1 Jun. - 30
Nov. 1967 (California Univ.) 3 p

N74-75463

Unclas
09/99 46078

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Much of the progress during the past six months was in the refinement of sample-handling technique and in the examination of terrestrial and extraterrestrial samples. The capturing and transferring of the gaseous samples by cryogenic means proved to be unreliable for the small quantities with which we had to work. Direct injection of the sample by means of a novel gas syringe has worked well. Retention times of mixtures of standard hydrocarbon gases (up to C_8) were determined for our experimental setup.

A survey of some different types of terrestrial rocks showed rather wide variation in the hydrocarbon gases evolved. This probably reflects the initial organic content, the thermal history, and the time exposure of the different samples. One young shale, however, showed marked variation in hydrocarbon gases from one-gram pieces adjacent to each other, reflecting the obvious heterogeneity of the organic fossil remains in the rock. An extensive survey of terrestrial rocks would probably have to be made before general statements can be made relating the hydrocarbon gases with the geological history of the rocks.

To date, we have examined four meteorites (Orgueil, Murray, Cold Bokkeveld, and Mighei) and the results show methane/ethane ratios no greater than about 20, and most on the order of 5. We also detected the presence of propane and higher homologs in our samples.

These preliminary results were presented at the meeting of Carbonaceous Chondrite researchers at Ames Research Center in October.

Recently, we have extensively examined the problem of generation of hydrocarbon gases from the polymeric organic material of meteorites and sediments which comprises approximately 95% of their organic content. We now have data that indicates that the generation of light hydrocarbon gases by impactation is a minimal problem, and that the gases evolved are really trapped gases. We have also shown that by heating a sample to 300 °C (after crushing) a very different suite of hydrocarbons evolved. These results are crucial to the experiments at hand. We intend to extend our analysis to other samples and to re-do some of the meteorite samples.